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PSEUDOMASARIS EDWARDSII CRESSON, ANOTHER POLLEN-PROVISIONING WASP, WITH FURTHER NOTES ON P. VESPOIDES (CRESSON).

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Last year I reported *P. vespoides* (Cr.) a pollen- provisioning wasp and gave some additional facts in regard to its nesting habits and biology. Since that time I have further verified these facts, both in California and in Colorado, and have in addition taken many nests of a smaller species, *P. edwardsii* Cr.*, at and near Pasadena and Sierra Madre, California. This species according to Bradley ('22) is found in Utah, Nevada, California and Washington.

The nests of this wasp have been found attached to rocks, often filling depressions in them, thereby making the outline of the rocks more even and the nests more difficult to find. The nest is of extreme hardness and can best be taken after a rain, which somewhat softens the material and allows it to be removed without such great peril to the larvae. If the nest is found during a dry season water may be used to soften it in the place of rain. The number of cells to nests taken has varied from one to ten—the maximum being somewhat less than that of *P. vespoides* which sometimes constructs as many as thirteen in a group. The following account is based upon nests of *P. edwardsii* taken from rocks, brought to the laboratory and the insects and parasites reared.

On January 29, 1928 a nest consisting of ten cells was taken from a rock at Sierra Madre, California. The general appearance of the nest was that of a nearly smooth deposit of gray soil, fine in structure. Close observation revealed no contour of cells. There were, however, two slight depressions, very small in diameter which later each proved to be anterior to a cell. If the other cells had ever possessed one they had all later been filled. Nine of the ten cells were horizontal, attached to the side of the rock, and only one vertical. A few cells overlapped, or were two deep, the rest consisting of but a single cell layer.

Three cells each contained a larva of *P. edwardsii;* two each held a pollen mass of this wasp; and five contained either parasites or hyperparasites of the pollen-user. One cell, when the nest was taken, contained twelve chalcid parasites already pupated and dark in color, showing that pupation had taken place a few days previously. They soon reached maturity but have not yet been determined. It is a question whether or not these are parasites or hyperparasites of *P. edwardsii.* The cocoon of the latter insect was present but the cocoon of no other was found within it. It would appear that they are parasites but further study is necessary.

Two cells each contained a cocoon of *P. edwardsii.* A male mutillid emerged from one on March 5, 1928 and a second male from the other on March 8, 1928. These were of the same species, one of which was sent to Professor

*—Kindly determined by Professor P. H. Timberlake.

Clarence E. Mickel for identification. He determined it to be a species of the genus *Photopsis* and wrote in regard to it: "The classification of this particular genus and its related genera is in a terrible shape and it is exceedingly difficult to identify specimens of the species. I hope within a year or two to be able to work on this group but at the present time I cannot give you an identification that would be worth very much." This species, I believe, is a true parasite of *P. edwardsii.*

A third parasite is a chrysid, *Chrysis* (*Gonochrysis*) *densa* (Cr.), identified by Leland H. Taylor. This species has previously been reported (Hicks '26) a parasite of the bee, *Osmia mandibularis* Cress. Later (Hicks '27) *C. densa* and a new species near *Chrysis tota* Aaron was found parasitic on *P. vespoides.* Two cells of *P. edwardsii* contained cocoons of *C. densa* one larva of which was injured. Two days after the nest was taken this larva was dead but the other became mature on March 9, 1928.

Another nest was found attached to the upper side of a rock measuring three feet in diameter, at Pasadena on March 26, 1928. The nest filled a crevice 30 mm. in length by 18 mm. in width and 14 mm. in greatest depth. This nest consisted of three parallel cells, the number being ascertained only after its removal for the general surface was smooth. Individual cells measured from the outside 20 mm. in length by 5 mm. in width. Two cells contained pollen masses while the third held a larva of the wasp.

A pollen mass from one cell measured about 12 mm. in length by 4 mm. in width and 3 mm. in thickness. The surface was covered with minute pointed projections or papillae, thus resembling the masses of pollen taken from nests of *P. vespoides.* The number from a mass of the former is nearly 200, the individuals of which have a broad base and pointed free end appearing as a series of minute cones over the surface. The form and nature of the pollen mass points to habits of provisioning similar to those of the larger *P. vespoides.*

The larva, when taken from the cell, is light in color and has a soft, limp body although not as limp apparently as that of *P. vespoides.* This larva, when about to pupate, measured 9 mm. in length, 4 mm. in width at widest point (just posterior to center of body) and 2 mm. in width back of the head. The length is not so great when first taken from the cell as the anterior segments bend over, concealing the head. A few days previous to pupation the head is gradually raised, the entire body becomes firmer and more rounded until it transforms. The larva of this nest pupated April 11th and was a mature female April 20th. It had been kept from the time the nest was taken until maturity at a temperature slightly above that of a room.

On May 8, 1928 I found a nest of *P. edwardsii* in a depression on a rock at Sierra Madre, California. It was of the general gray color except for two plugs which were dark and which closed each a cell of the wasp which had been secondarily used as a tunnel by a bee of the genus *Ashmeadiella.* In removing the nest I injured one series of three bee cells (containing on this date young larvae) and one larva of *P. edwardsii.* The cells containing the bees had secondarily been appropriated, for the cocoon of *P. edwardsii* was about the inner side of the cell. This cocoon is light in color and is in close contact with the inner walls. It appears somewhat thicker than that of *P. vespoides.* Of the five cells, made

visible upon removing the nest, four were parallel, the other at right angles. The inner measurements were about 15 mm. for length, including the 2 to 3 mm. in length of feces at the bottom, and 3 to 4 mm. for the width or diameter.

A number of nests of *P. edwardsii*, not differing in fundamental structure with the ones described, were found and a few marked, during the late winter months in an attempt to obtain dates of emergence and to better observe the insects at work in the field, but duties prevented me being in the field at the opportune time. Much valuable and interesting work needs to be done in observing both *P. edwardsii* and *P. vespoides*, as well as other related species, construct and provision their nests. The author hopes to be able to do some of this during the coming season. Professor P. H. Timberlake states that this wasp is common at Riverside in the spring (May 14) and visits the flowers of *Phacelia*. There is much evidence here that there is but one brood a year.

FURTHER NOTES ON P. VESPOIDES.

Professor T. D. A. Cockerell ('13) reported the nest of a variety, *P. vespoides robertsoni* Ckll., bred in California. The nest had been fastened to a stem and resembled those described by Dr. A. Davidson ('13).

During the spring of 1927 some further observations were made of *P. vespoides* in Colorado; in 1928 a few additional facts were learned from studies in California. On May 29, 1927 these wasps were found near the Armory, close to the University visiting flowers of *Penstemon acuminatus** Dougl. Lindl. A male, after sipping nectar from the flowers or going for a short flight, had a habit of returning to a rock close to the ground and resting on its surface in the sun. Before alighting he would hover above the spot, then alight and remain with wings outstretched, nearly but not quite at right angles to his body.

At 11:45 a.m. this male was found copulating with a female on a flower of *P. acuminatus*. The female was in position for obtaining nectar; the male upon her with his antennae bent forward and gently tapping her with them on the front of her thorax. Her fore legs were folded, her wings held lightly to the side and her abdomen somewhat elevated. Soon there was considerable buzzing. It could be seen that the two were in copula and after 15 seconds of intense buzzing, both flew away. The female soon returned to collect while the male flew again to his rock. Later this male darted a number of times at a bumble bee queen as she was feeding on the flowers of Penstemon. Again, while a female bee, *Anthophora neomexicana* Ckll., was feeding on *P. acuminatus* he flew up to and around her but did not alight as he had done in the case of the queen. There have been found many instances where males, both of wasps and bees, have tried to mate with females of widely differing genera and families.

The male often made excursions, rather periodically to the flowers and appeared to look them over as though he were searching for a female. These trips were intervalled by periods of inactivity or rest on the ground, more often on the stones, and less frequently on twigs. When a strong wind came he folded his wings nearly parallel to his body, until it became quiet once more. He was caught while feeding and his reactions to capture noted. He tried very hard to bite me with his mandibles and jab my hand with his genitalia, the latter proving the more effective weapon of the two. He flew away upon release but was soon

*—Kindly determined by Dr. Edna Johnson.

back to his accustomed resting place. When flying both the male and the female produce a fairly loud, buzzing sound. Their flight may be quite swift although somewhat erratic and hard to follow, even though they may not be flying very high.

A female was followed and was found to rest five times while visiting sixty-three flowers. In resting she would alight on a bare spot on the ground or on a rock, remain nearly motionless for a time, then clean off her head and fore part of her body with her fore legs. These wasps were watched again at the Armory the next day but my observations here were cut short by a student who caught these insects for his collection. However, *P. vespoides* was found fairly common a few days later near Owen's Lake visiting the same kind of flowers. The flowers were not very abundant at this time, due probably in part to the weather being excessively dry.

A female was early found, resting with her head deep in the corolla of the flower. This habit has been observed many times both in the males and females. It was found that when the sun was under a cloud all rested after this fashion. The insect holds onto the flower parts with its mandibles and rests until the sun shines again. When it is cloudy, rainy, cool, or when night comes on *P. vespoides* can be taken by searching among the flowers. If removed at this time they are found "sleepy" and listless.

Mating was again observed at the flowers at Owen's Lake. A male with a deformed left antenna took part in this. It seemed that this male was longer on the female before copulation took place than in the other instance although the period in copula was short, accompanied by loud and energetic buzzing. This male also had the habit of returning to the same, or nearly the same spot, to rest.

Females were followed in an attempt to locate the nest but each trial failed. Her general activity was to visit a few flowers, alight on a bare spot or rock near, stay for a time, then fly to the flowers, visit eight or ten and repeat the rest. It seemed possible that at these periods of rest, *P. vespoides* may have been removing some of the pollen from her head and swallowing it, but of this I am not sure.

The female usually, if not always, starts at the bottom flowers of a stalk and visits those above, often in regular order. A female or male have never been seen to start at the top flowers and work down if there were more than one flower on a stalk. The female flies from the top of one flower to the base of the next flower stalk and there begins to obtain nectar and pollen.

Although there were many plants other than Penstemon in the field, *P. vespoides* did not feed or collect from any other of them. The only additional flower to receive any attention at all was that of *Argemone* sp., a wild white poppy blossoming at the time. A female wasp flew over this flower, appeared ready to alight on it but soon flew away without doing so.

A number of nests of this wasp have been found at or near Pasadena, California. The cells number from one to thirteen and have been found attached either to plants or to the side of rocks. The plants on which they have been found are: Live Oak; Wild Buckwheat (*Erigonum fasciculatum*); *Lotus scoparius;* and two unidentified plants.

A nest consisting of thirteen cells was found on March 11, 1928 at Pasadena on *Erigonum fasciculatum*. The nest was watched almost daily to find dates of emergence and to see if the wasps used the cells again. On April 30, two had emerged; May 1, three; May 2, two (one other opened contained a nearly mature female); May 3, one; May 5, two; May 7, one; a wasp failed to emerge from the last cell. There was no evidence from this nest that these wasps ever returned to rest in the cells or to use them a second time for nesting. The insects emerged at a time when there had been no rain for days, hence the cap which may catch rain and aid in softening the material for a more successful emergence is not an absolute necessity.

A nest taken at Sierra Madre in the winter contained two larvae: One soon reached maturity; the other was still in the larval stage six months later. The adults rest in the flowers in the field here as did those observed in Colorado. On May 8, we had a very heavy rain at Sierra Madre and during this time many males and females were resting in the flowers of the Tinted Penstemon, *Penstemon heterophyllus*. No additional parasites to those reported (Hicks '27) have been reared from this wasp. A bee, *Ashmeadiella* (close to *californica**), and its chrysid parasite have been reared from cells secondarily formed in the mud cells of *P. vespoides*.

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THE BIONOMICS OF TETRASTICHUS VERRUCARII (CHALCIDOIDEA) WITH NOTES ON ITS HOSTS (NEUROTERUS SPP., CYNIPIDAE) ON BUR OAK.*

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In an earlier volume (1) the writer presented observations on the bionomics of the parasites and inquilines from the galls of *Disholcaspis mamma* (Walsh) on a bur oak (*Quercus macrocarpa*) near Urbana, Illinois. Not less than fifteen species of Hymenoptera were then associated with that gall. In the last two years this gall and its several inhabitants were rare or lacking there, but the leaf galls of *Neuroterus verrucarum* O.S. and *N. niger* Gillette were abundant on the same

*—Determined by Professor P. H. Timberlake.

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(1).—Balduf, W. V. On the Bionomics of some Hymenoptera from a Bur Oak Cynipid Gall. Can. Ent. Vol. 58, pp. 135-143 and 157-164, June-July 1926.

tree. The larvae of the latter cynipids are heavily parasitized by a chalcid, *Tetrastichus verrucarii* Balduf of the family *Tetrastichidae*. Observations on the habits and stages of the parasite and its hosts are given below. These records incidentally extend the known hymenopterous fauna of the above tree by four or more species.

NOTES ON THE HOSTS

Our knowledge of the bionomics of these *Neuroterus* species is but fragmentary. Many of the galls of both species are also inhabited by inquilines which destroy the gall maker larvae, leaving only the flattened brown remnants of the dead insects. The larvae of the gall makers and of their inquilines can not be distinguished to date. The occurrence of several varieties of *N. niger* whose larvae are also not distinguishable to date, serves further to complicate the study of these galls and their fauna. The galls of both *Neuroterus* species are monothalamous.

N. niger of the present variety is known to the writer only in its bisexual or spring generation. Its galls, which develop on the foliage, are about one millimeter in diameter above, blister-like in form, corky in texture, and green to reddish brown. Oviposition of Cynipidae (*N. niger* or inquilines) was observed on both May 14 and 21. The galls began to appear before the middle of May in 1927, when the leaves were still in the unfolding stage, reddish brown and tender, and by June 17 had become light yellow spots about the size and shape of a large pin head. Exit holes, whether of parasites, inquilines or gall makers, were common on July 22, but Cynipidae issued strongly for another week, and all live insects had gone out of the galls by August 30. All of them issued through the lower surface of the galls, and the pupae lie in the lumen with their venters downward. Less than fifty percent of the leaves bore galls. These were for most part quite definitely distributed over one side or the other of the individual leaves, the other half being mostly free of them.

Neuroterus verrucarum, variety undescribed, is known to date only in its agamic, or fall generation. On June 22, 1927, the galls had already become abundant, quite large, and caused the more heavily infested leaves to curl up at the edges. Some small, recently unfolded, but reddish leaves were still present on the tree, and the galls were appearing on these and other comparatively young foliage growing on the short lateral twigs of the larger branches. On this date, the larvae in the galls were mostly only about one-tenth grown, or about one-tenth millimeter long, robust, and almost globular, with the food contents showing dark through the body wall. Some of the galls were less than half-grown on August 18. On September 19, many of the heavily infested leaves had fallen to the ground, some being still green. The species winters in the gall as a full-grown larva. Some brown pupae occur in the wintering galls, but whether they are the gall makers or inquilines was not learned.

The mature galls are two or three millimeters in diameter but irregularly round. The top is corky, broad, green to reddish-brown with coarse, wart-like elevations. The under side is covered with a dense mat of long tangled hairs through which the adult insect issues. Adjacent galls sometimes become fused, more frequently along the larger veins of the leaves, where the larvae survive more often than elsewhere on the leaf.

THE LIFE HISTORY OF TETRASTICHUS VERRUCARII

The adults of this species are described in the preceding paper. Inasmuch as the larvae of both the gall makers and the inquilines are present in these galls, it is probable that the parasite attacks all of them. The occasional discovery of two cynipid larvae in a single gall, one collapsed and the other normal, indicates the gall maker-inquiline relation. Now and then a chalcid larva was found associated with the inquilines, showing that all the cynipids in these galls are probably subject to parasitism.

The larvae of *Tetrastichus verrucarii* and those of its cynipid hosts are readily distinguished. The head and caudal ends of the parasite are similar, the body of the larger individuals assumes a curved position in the gall, the segments are regular in form and of almost uniform size, except the thoracic segments which are longer, the surface is unwrinkled, and the mouth parts are reduced. The larvae of the spring generation were smaller, and the color of many that were almost mature was lemon yellow, while the younger forms were dull white, like those of the other generation.

The head of the cynipid larvae is distinct, hidden beneath the thorax, and bears mandibles conspicuous on account of their relatively large size and more obvious brown color. The body is more robust, strongly arched above, the segments are wrinkled and less defined, and the color a rather clean white.

The pupae of the hosts and the parasites are similar to their adults in form, and vary from white to brown in the Cynipidae and the parasite from white to black during the stage. The filiform antennae of the host adults and the geniculate type of the parasite are ready aids in distinguishing them.

HIBERNATION AND SPRING DEVELOPMENT

The parasite winters as a mature larva on the ground under the oak tree in the cell of the verrucarum galls with the host remains. *T. verrucarii* adults appeared first on April 20, 1927 in an indoor cage. They were quite common on the opening leaves of the tree on May 14, 1927, with the temperature at 63°F., but were not very active. While the Cynipids were ovipositing commonly on that date, the parasites were not doing so. Others occurred on the ground among the leaves bearing the *N. verrucarum* galls from which at least some of the parasites were coming. Adults were more numerous on May 14 but none were ovipositing. Mating was observed on May 22 in a cage of galls collected May 14. The *niger* galls had become yellowish and as large as pinheads by June 17, and on that date *T. verrucarii* was plentiful ovipositing in the galls. At this time the host larvae were minute, only about one-tenth grown.

When ready to oviposit, the parasite female walks in a deliberate manner over the upper surface of the leaf and stops at most of the galls she finds by tapping the leaf with her antennae. Standing on or over the gall,, she unfolds the ovipositor from the venter of the abdomen, aims it obliquely at the leaf, and thrusts it into the yellowish gall. Thus she stands quite motionless, for four minutes in instances noted, after which she seems to brush the end of the body over the gall where the ovipositor had been inserted. Other galls were then sought. Probably one egg is deposited in each gall; more than one parasite per gall was never found.

Galls of *N. verrucarum* caged on April 17, 1927 and kept indoors, continued yielding parasites until June 17. Others caged on June 25, 1927 were still producing adults in good numbers on July 9.

From numerous dissections of galls at various dates in 1927, the following data are known. On June 28, the larvae were from one-half to full grown, and about sixty percent had pupated, a minority of the latter being in the advanced, black-color stage. Approximately the same proportions of these states occurred on July 5. By July 22, a small percentage of adults had issued from the galls, and the immature forms were largely almost full grown larvae, and the pupae were chiefly black. On August 3 and 12 the majority of adults had issued, but a few were still larvae, mostly well-advanced. Yellow as well as black pupae existed, but a large increase in exit holes on the latter date over the former was obvious. Only a few parasites still dwelt in the galls on August 18. Oviposition began in the spring somewhat before June 17, hence the spring generation of the parasite covers a period of about two months, counting from the first oviposition to the emergence of the last adult.

THE FALL-WINTER GENERATION

Assuming that the adult parasites that issued from the *niger* galls from July 22 to August 18 began ovipositing quite promptly, the approximate date of the beginning of the fall-winter generation of the parasite is latter July. All the larvae examined in March had become mature, hence maturity is reached in the fall, and pupation takes place the following spring. Two generations develop therefore, the first on the spring generation of the *N. niger*, the other on the fall generation of *N. verrucarum*, each of the parasite generations running quite parallel with its corresponding gall maker generation. When the alternate generations of these gall makers are known it will be of interest to note whether their parasite has been able to follow them into their more obscure positions.

Inasmuch as the galls of the two known generations of these two species overlap more than a month in August and part of July, it is probable that early adult parasites of the second generation attack cynipids in the late formed galls of the *niger* generation. A few tiny parasite larvae found on host larvae near the end of the *niger* spring generation when all other parasites were advanced in growth, indicates this possibility.

SUMMARY OF THE PARASITE GENERATIONS

Winter is spent as full grown larvae in the galls of *N. verrucarum* on the ground. Adults developed from the overwintered larvae issue from early May to nearly mid-July. The spring generation adults appeared from *niger* galls from the third week of July to the third week of August, and gave rise to the fall generation that reached the mature larval state before winter.

HABITS OF THE PARASITE LARVA.

The larva of *T. verrucarii* is ectoparasitic chiefly on the larval stage of the Cynipidae and lies with its body curved obliquely across the top of its host. Rarely is the parasite found to have broken through the host's body wall, and in one such instance the parasite had entered the host which was a brown pupa. Various size combinations of parasite and hosts are found, a small parasite larva on a large host larva, or parasite and host may be much the same size. But the host usually has made good growth before the parasite appears. Occasionally,

half the body volume of the host remained when the parasite larva had become full grown.

In the case of two contiguous galls,—one containing remains of the host larva and the other occupied by a large fresh Cynipid larva attacked by a well advanced chalcid larva, the parasite may sometimes pass from one gall to the adjacent one. In some such partitions brown spots are to be found, or even small holes may lead from one gall to the other. These separating walls, particularly of the younger *niger* galls are thin and soft. No doubt the chalcid sometimes oviposits in galls containing very immature Cynipids whose capacity for growth under the handicap of a parasite near its own size is inadequate to sustain the enemy. In such instances, hunger may stimulate the chalcid larva to migrate and perhaps to penetrate to the adjacent gall. A small percentage of dead parasite larvae were discovered on mere shells of the host, suggesting starvation resulting from attack upon a host too small to nourish the parasite to maturity.

RATE OF PARASITISM: OTHER ENEMIES OF THE GALL MAKER.

Many gall makers, and parasites also, are killed by foreign agents, as many as sixty percent having been found, by dissection, to be dead in each generation in the midst of their growing periods. Such galls are small, and the contents are in various states of decomposition, varying from freshly killed, white tissue to black liquified bodies or dried solid remains. The causes of these fatalities can not be named in all instances. However, some galls have a small brown spot on the top suggesting that predators with piercing-sucking mouthparts may have been responsible. The occasional discovery of a fresh, white collapsed larva in its cell confirms the predator theory. An arboreal species of Reduviid, *Acholla multispinosa* DeGeer, both nymphs and adults, was present on the leaves in good numbers in both 1927 and 1928, and its size would require puncturing many galls daily to get sufficient food, if this species was concerned. *Triphleps insidiosus* was also present, but is not strongly suspected of complicity here. Aphids and leaf hoppers were abundant, but it would be strange to find these sucking fluids from gall insects, except by chance. Both these insects and the galls were abundant, increasing this chance,—the like of which may be one manner in which phytophagous insects become predaceous. Dr. Kinsey informed the writer that there are Cynipid species with inquilines that kill the gall maker.

In addition to *T. verrucarii*, *N. verrucarum* and *N. niger* may have been parasitized also by several other species of Chalcids taken in very small numbers from the cages of galls.

The rate of parasitism of *N. verrucarum* and *niger* by the larvae of *T. verrucarii* was constantly quite high. From the overwintered *N. verrucarum* galls caged from April 17, 1928 to June 17, 1928, 3192 adults, of which 1241 were Cynipidae, including *verrucarum* and its inquilines, and 1951 parasites, were obtained.

The fact that many galls are killed by inquilines may not affect the percentage of parasitism inasmuch as the inquiline may in turn become the host when the guest has killed the maker larva. In this cage, the rate of parasitism in *N. verrucarum* galls was then sixty three percent. Other cages containing *verrucarum*, although not carried through the whole emergence period, indicate similar percentages. By dissection of *N. niger* galls of June before either parasite

or host emerged, forty percent of 377 galls contained parasite stages. Again, dissections of hundreds of other galls of the latter species during July after some adults had issued, pointed to a consistently high rate of parasitism, estimated to be somewhat above fifty percent for the season. In spite of this handicap of parasitism, most of the foliage on the tree was heavy with galls, and most of the leaves occupied by the *N. verrucarum* larvae were much curled. The early summer *N. niger* galls being much smaller, but no less plentiful, cause no such distortion of the leaves and perhaps no appreciable harm to the tree. If the parasite larva should be shown to cause continuation of gall growth after its host is overcome, *T. verrucarii* would be of no value to the host plant in spite of a high mortality among these gall makers due to its parasitism.

NEW SPECIES OF SCATOPHAGIDAE (DIPTERA).

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Cordilura passiva n. sp.

(Fig. 1)

Black; parafacials and cheeks yellow; frontal vitta obscure reddish on lower half. Length, 5 to 5.5 mm.

♂. ♀. Face and cheeks white, the occiput and parafrontals, greyish pollinose; frontal vitta with thin whitish pollen in some views. Palpi and antennae blackish. Thorax cinereous pollinose, with darker vittae from posterior view; acrosticals in two rows; hair black; apical pair of scutellars as long as basal pair, cruciate. Legs black, thinly cinereous pollinose; tibiae sometimes brownish. Wings cinereous; veins brownish red; first vein setose on apical section. Abdomen thinly greyish pollinose. Outer genital forceps with two angular productions apically (fig. 1). Female genitalia shining black.

Holotype, ♂, *allotype*, ♀ and ♂ *paratype*, Tennessee Pass, Colo., July 9, (J. M. Aldrich). Types in United States National Museum. Paratype No. 2808 in the Canadian National Collection, Ottawa.

Outer forceps of males of (1) *C. passiva* n. sp. (2) *C. ontario* n. sp. (3) *C. varicornis* n. sp. (4) *C. alberta* n. sp.

Cordilura varicornis n. sp.

(Fig. 3)

Black; face, cheeks and halteres yellow; frontal vitta and a spot on the second antennal segment reddish. Length, 4.5 to 5.5 mm.

♂. ♀. Face, cheeks and sides of front below white pollinose, the pollen elsewhere more greyish; occipital pile whitish; palpi and antennae deep black. Thorax moderately greyish pollinose; with median whitish vitta from posterior view; three or four pairs of strong acrostical hairs; two pairs of strong scutellars, the apical pair sub-erect; pile of pleura yellowish. Legs black; femora thinly greyish pollinose. Wings cinereous, the veins brown; first vein bare.

Squamae very pale yellowish. Abdomen moderately greyish pollinose; hair of venter pale. Outer forceps as in figure.

Holotype.— ♂, Banff, Alta., May 5, 1922 (C. B. D. Garrett), No. 2812 in the Canadian National Collection, Ottawa.

Allotype.— ♀, Banff, May 25, 1922.

Paratypes.—3 ♂, 3 ♀, Banff, May 25, 26, June 3, 18, 1922 (Garrett).

Cordilura inversa n. sp.

Black; face, cheeks and legs reddish, coxae and anterior femora black; first vein setose on apical section. Length, 8.5 mm.

♀. Frontal vitta reddish, with whitish sheen; occiput and front greyish pollinose; face, cheeks, frontal orbits below and posterior orbits on lower half, with white pollen, occipital pile white. Palpi black; black haired. Antennae black; second segment partly brownish red. Thorax cinerous pollinose; with whitish median vitta from posterior view; acrostical hairs strong; four pairs of strong scutellars, the apical pair sub-erect; pleural pile pale yellowish; legs thinly greyish pollinose. Wings greyish luteous basally, the veins luteous, darker apically; first vein setulose. Squamae whitish; halteres yellow. Abdomen cinereous pollinose; genital segments shining black.

Holotype.— ♀, Oliver, B. C., June 8, 1923, (C. B. D. Garrett), No. 2814 in the Canadian National Collection, Ottawa.

Cordilura criddlei n. sp.

Black; head and legs largely yellowish; palpi yellow; first vein setose on apical section. Length, 5.5 mm.

♀. Head yellow, the occiput and upper half of front black; frontal vitta reddish yellow; head with greyish pollen, the face and cheeks white; lower half of occiput pale yellowish haired. Palpi yellow, the hair yellow and black. Antennae black, the second segment reddish except basally. Thorax with greyish pollen, a median vitta on the mesonotum appearing whitish from posterior view; two pairs of presutural acrostical hairs; apical pair of scutellars very weak; pleural pile pale yellowish. Anterior coxae about half yellowish, femora black, with greyish pollen, their apices and the tibiae and tarsi reddish yellow. Hair on under surface of femora whitish. Wings cinereous hyaline, the veins becoming yellow basally. Squamae whitish, halteres yellow. Abdomen thinly brownish grey pollinose; genital segments shining black.

Holotype.— ♀, Nicola, B. C., July 25, 1925, (N. Criddle), No. 2811 in the Canadian National Collection, Ottawa.

Cordilura fasciventris fulvithorax n. var.

Differs from typical *fasciventris* by having the abdomen wholly black, the fifth segment sometimes reddish, and sometimes with traces of reddish spots on the sides of the segments. The thorax may have indication of two broad, darker vittae above and the black of the pectus may extend more onto the pleura.

Holotype.— ♀, Banff, Alta., Aug. 18, 1922 (C. B. D. Garrett), No. 2813 in the Canadian National Collection, Ottawa.

Paratype.— ♀, Banff, Aug. 8, 1922 (Garrett).

Cordilura ontario n. sp.

(Fig. 2)

Black, halteres and anterior tibiae yellowish, middle tibiae and all the tarsi reddish brown; posterior tibiae brown with pale base and tip. Length, 5 to 7 mm.

♂. ♀. Face, and cheeks yellow, white pollinose; frontal vitta reddish on anterior third or more; pollen of occiput and front pale greyish. Antennae and palpi black. Thorax cinereous pollinose, from posterior view with a median whitish vitta. Acrosticals weak, often only two or three present in front. Apical scutellars about half as strong as basal pair; hair of pleura yellowish. Wings cinereous, luteous on basal fourth or more, the veins becoming brownish apically. Squamae white. Femora grey pollinose, their tips yellowish; hair yellow, black on upper surface and apices; tibiae and tarsi black haired, the anterior four tibiae yellow haired beneath. Abdomen greyish pollinose, black haired dorsally; outer genital forceps of ♂ with very deep incision, (fig. 2). ♀ genitalia shining black with more or less reddish apical portion.

Holotype.—♂, Ottawa, Ont., June 2, 1927 (Curran), No. 2810 in the Canadian National Collection, Ottawa.

Allotype.—♀, same data.

Paratypes.—7♂, 10♀, same data; 6♂, 2♀, Ottawa, June 8.

Cordilura alberta n. sp.

(Fig. 4)

Black, the tibiae, tarsi and tips of femora reddish yellow. Length, 8.5 to 9.5 mm.

♂. ♀. Face and cheeks yellow, with white pollen; frontal vitta reddish on more than lower half; head greyish pollinose; palpi black, with fine yellow hair on outer edge, the apical bristle long. Thorax with cinereous pollen, and with a broad, more whitish median vitta when viewed from behind. Apical cruciate bristles of scutellum over three-fourths as long as basal pair. Coxae and femora grey pollinose; coxal hair yellow, the posterior four coxae each with a black bristle on outer portion; femora with yellow hair below; hair of legs black. Wings with luteous tinge, the veins luteous or brownish red. Squamae and halteres pale yellowish. Abdomen of ♂ long and narrow, greyish pollinose, black haired above. ♀ with the apices of the femora broadly reddish, the abdomen broader and tapering apically.

Holotype.—♂, Banff, Alta., July 7, 1922, (C. B. D. Garrett), No. 2809 in the Canadian National Collection, Ottawa.

Allotype.—♀, same data.

Paratypes.—2♂, same data; ♂, ♀, Banff, June 1, 1922; ♀ Banff, June 30, 1922; ♂, Banff, July 1, 1922; ♀, Banff, June 12, 1922; ♂, Banff, Aug. 23, 1922; ♀, Banff, Sept. 13, 1922 (Garrett); ♂, Victoria Beach, Man., Aug. 8, 1926, (N. Criddle); ♂ Stockton, Man., July 29, (Criddle).

Acanthocnema Becker.

Berl. Entom. Zeitschr., XXXIX, 136, 1894.

Genotype—*Cordilura nigrimana* Zetterstedt.

There are four species belonging to this genus from North America, one of them originally described from Europe.

1. Antennae wholly black ..... *capillata* Lw.
   Antennae mostly reddish ..... 2.
2. Thorax wholly black ..... 3.
   Thorax yellowish laterally (N. Hamp.) ..... *albibarba* Lw.
3. Stigmatal bristle present ..... *nigrimana* Zett.
   Stigmatal bristle absent ..... *ruficauda* n. sp.

Acanthocnema ruficauda n. sp.

Black; legs, apical abdominal segment and genitalia reddish; palpi white. Length 6 mm.

♂. Head yellow upper half of occiput and upper half of front black, brownish grey pollinose, the head elsewhere with white pollen; frontal vitta orange; beard white, palpi white, white haired. Proboscis reddish, with fine white hair. Antennae reddish, the upper edge narrowly brown; arista black, bare. Thorax thickly grey pollinose, the mesonotal pollen with strong brownish tinge; a brown vitta along the dorso-central row and a weak, dark vitta above the wings. Hair black, on pleura, yellowish; two pairs of equally strong scutellars. Coxae reddish, the anterior pair white pollinose and pilose; anterior femora white haired beneath and posteriorly, the others with white hair basally on ventral surface; the hair of the legs short; anterior tibiae with rather long hair on median half of ventral surface and with a row of strong, short setae on the apical three-fourths of the antero-ventral surface. Wings cinereous hyaline, the veins reddish brown apically, luteous basally, narrowly clouded with pale brown. Squamae pale yellowish, their border and the halteres yellow. Abdomen moderately grey pollinose, black haired above; fifth segment and genitalia reddish; sides of fourth sternite with erect, bristly hairs; outer genital forceps clothed on apex with thick, apically crinkly yellow hair.

Holotype.— ♂, Tennessee Pass, Colo., July 27, (J. M. Aldrich), in United States National Museum.

Cordylurella Mall.

1. Blackish species ..... 2.
   Shining reddish yellow species ..... *rufula* Curran.
2. Antennae wholly yellow ..... 3.
   Third antennal segment black ..... *nebulosa* Coq.
3. Costal border broadly brownish; arista yellow on basal half; mesonotum with two broad, shining vittae ..... *costalis* n. sp.
   Wings cinereous hyaline; arista black; mesonotum with four shining vittae ..... *subvittata* Mall.

Cordylurella costalis n. sp.

Black, the head, legs and venter pale. Length, 4 mm.

♀. Upper two-thirds of occiput and fifth of the front, black; vertex broadly grey pollinose; face, cheeks and palpi whitish; front yellowish, the sides whitish; antennae yellow; most of frontal bristles and vibrissae yellow; hair black on upper half of occiput, elsewhere yellowish. Proboscis reddish. Thorax moderately grey pollinose, a broad vitta lying outside the acrosticals and a large spot on the mesopleura and hypopleura, shining black. Scutellum with four strong bristles; hair of pleura pale yellowish, not conspicuous, most of the mesopleural bristles and the stigmatal and propleural bristles, yellow. Prosternum

and front coxae white; legs yellow, the posterior four femora each with a brown tip. Costal border broadly brownish, the first to fourth veins brownish, the others yellow, all the veins yellow basally. Abdomen shining black, the tips of the segments grey pollinose, each segment with an obscure, transverse, basal triangle of greyish pollen visible from some views. Hair of dorsum yellow on first three segments, black on the others.

Holotype.— ♀, Covey Hill, Que., June 18, 1927, (G. S. Walley), No. 2815 in the Canadian National Collection, Ottawa.

A NEW CYLINDROCOPTURUS (COLEOPTERA).

BY F. S. CARR,
Medicine Hat, Alta.

Cylindrocopturus medicatus n. sp.

The vestiture is of two kinds: The first consists of narrow flattened hair-like scales found in the striae, one before each puncture; these are closely appressed to the elytra. The second consists of a very dense covering of flat scales, broadly elliptical in shape, covering densely the elytra, the thorax, the under side of the body, the head except for the beak, the legs except for the under surface of the tarsi which are covered with black pubescence. The vestiture consists of a mixture of white and brown scales, the mixture being found on all parts of the body, without any very definite arrangement except on the pronotum. On the pronotum the brown scales are arranged in two large brown spots at the base, separated by a thin line of white scales and an indefinite line of brown along each side from base to apex. On the elytra are found two indistinct light colored transverse bands, neither of which reach the sides. In the paratype material, the coloration of the elytra shows great variation.

The length from the anterior margin of the pronotum to the apices of the elytra is 3.75 mm.

Head. The beak is slender, coarsely punctate from base to apex with numerous punctures, and with a slightly elevated, impunctate carina along its length. The antennae are reddish with scanty black pubescence. The first funicular joint is slightly shorter than the second, the club is long and slender. The eyes are close together, pointed below with the narrowest interocular space a little above the middle of the eye. This space is almost one half the width of the eye at that point.

Thorax. The thorax is very long being approximately three eighths the length of the beetle. This appearance of length is accentuated by its shape. Posteriorly there is very little constriction; then for two thirds the length the sides are almost parallel, tapering regularly to the apex for the balance of its length.

Elytra. The scutellum is almost circular in outline. Each elytron is regularly rounded at the base with this rounded portion curved upwards from the plane of the balance of the elytron. At the apical sixth the elytra are suddenly bent downwards and are turned upwards again at the apex. The elytra are not at all tuberculate nor are any erect setae found.

Abdomen. The abdomen is particularly closely covered with scales. The tubercles on the second segment are but fairly developed. The size of these tubercles varies greatly among the paratypes, in some cases being very weak.

Type marked 24. VII 26 Medicine Hat, Alta., F. S. Carr, collector; No. 2894 in the Canadian National Collection. Eight *paratypes* all taken at Medicine Hat are used in the description; one of these will be deposited in the United States National Museum and one in the collection of Mr. H. C. Fall.

The species appears to show great variation. The tubercles as noted above, vary from weak to fairly well developed. The color varies from the deep coloration of the type, to a light form where the brown on the pronotum is restricted to the two large brown spots and on the elytra to a brownish cloud covering in each case the disc of each elytron.

Apparently the species is related to *littoralis* Fall. From this species it may be distinguished by the longer second joint of the funiculus, by the shape and great length of the thorax, by the longer and more slender beak, by the very heavy vestiture and by the upcurved basal and apical margins of the elytra.

The writer acknowledges the advice and assistance given by Mr. Fall and also the loan of *quadridens* Horn, *mammillatus* Lec. and *littoralis* Fall from Mr. Fall's collection.

A NEW BEMBIDION (COLEOP.)

BY MELVILLE H. HATCH,*
Seattle, Wash.

Bembidion (Peryphus) mackinacens's n. sp.

Length 4.4 mm. Black, shining, margin of elytra feebly greenish, appendages slightly rufescent. Head as wide as pronotum at apex. Pronotum narrower than elytra, 70 per cent. (♀) to 74 per cent. (♂) as long as broad, apex 74 per cent., base 80 per cent. as wide as pronotum at widest. Sides of pronotum broadly arcuate in front, feebly sinuate behind; front angles round; hind angles right; apex feebly emarginate; basal impressions bistriate; median line nearly entire. Elytra octostriate; the striae entire, three and four and five and six severally confluent towards apex; the third stria with two dorsal punctures; the striae coarsely punctate, the punctures absent on apical fifth; the eighth and marginal striae evidently finely punctate, distant from each other except on basal fourth.

Type.—♂ Douglas Lake, Mich. July 1926, R.S.K.

Six paratypes (♂ & ♀); Douglas Lake (vii-7-1917 and July 1926); Cecil (Allotype); Cecil Bay, and Carp L. (vii-22-23, 1920) in Emmet Co., Mich.; Hog Is., Charlevoix Co., Mich. viii-24-1922, this last listed as *B. honestum* Say by Hatch, Mich. Acad. Sci. IV, 1924, p. 548. Usually found under cover on the damp sand of lake beaches.

This species does not fit into any of the alternatives under couplet "2" of Casey's key (Mem. Col. VIII. 1918, p. 47); the eighth stria is distant from the margin, both it and the marginal stria evidently, finely punctate; the elytral striae entire; the legs rufescent. According to Hayward (Trans. Am. Ent. Soc. XXIV, 1897, p. 58), it runs to *concolor* Kby., but it is distinguished therefrom by the base of the pronotum being wider than the apex.

I take this occasion to point out the discrepancy between Hayward's (p. 60) and Casey's (p. 51) descriptions of *concolor* Kby. The striae according to Hayward are strongly impressed, according to Casey are feebly impressed.

*—Contribution from the Zoological Laboratory of the University of Washington.

NEW CANADIAN ANTHOMYIDS BELONGING TO THE GENUS HYLEMYIA ROB.-DESV. (MUSCIDAE, DIPTERA).

BY H. C. HUCKETT,
Riverhead, N.Y.

(Continued from page 119)

Hylemyia replicata sp. nov.

Male blackish, closely resembling *latipennis* Zett.; head black, parafrontals, parafacials, and cheeks velvety whitish pruinescent; antennae and palpi black. Thorax lightly grayish pruinose, subshining, scutellum viewed from behind grayish (not blackish), mesonotum with three brownish vittae, and lateral areas considerably infuscated. Abdomen whitish pruinose, pearlaceous, with dark reflections; dorsocentral vitta black, each tergal portion, when viewed from behind, slightly broadened cephalad; tergal incisures not evident; hypopygium with basal sclerites black, shining, the caudal (prebasal) sclerite thinly grayish pollinose not glossy. Legs black, subshining. Wings tinged with yellow, especially basad; calyptrae and halteres yellowish.

Head with eyes separated at narrowest by distance equal to that between posterior ocelli inclusive, cruciate setulae present; parafacials at base of antennae prominent, exceeding in width the average breadth of third antennal segment, narrowed ventrad; cheeks fully equal to average width of third antennal segment, marginal bristles strong, in single series; third antennal segment gradually narrowed apicad; arista swollen at base, densely short pubescent, longest hairs not equal in length to diameter at base of arista; palpi rather short; proboscis narrow, slender. Thorax with acrosticals paired, closely set and of irregular size, four presutural pairs; prealar bristle longer than posterior notopleural bristle, posthumeral bristle duplicated; sternopleural bristles, 2:3; scutellum setulose on disc. Abdomen conical, hyopygium prominent as in *latipennis*, processes of fifth sternum truncate apicad, with a dense series of longish setulae on entire inner (ventral) margin, outer surface with fine setulae and a series of 2 or 3 longish bristles on proximal half, outer (dorsal) margin bare, with a glossy chitinous, platelike projection at apex.

Fore tibia with 1 or 2 anterodorsal, 1 median posteroventral, and a strong, pointed, apical posteroventral bristle: mid femur with or without a basal anteroventral bristle, and with 5 or 6 strong bristles on proximal half of posteroventral surface; mid tibia with 2 anterodorsal, 2 posterodorsal, and 2 posteroventral bristles: hind femur with an entire series of anteroventral and posteroventral bristles, the latter becoming much longer and stronger proximad; hind tibia with 9 to 11 anteroventral setulae which become stronger apicad, with a short series of duplicating setulae on basal half, 4 or 5 anterodorsal, 4 or 5 posterodorsal bristles, and a series of 14 posteroventral setulae, the proximal half of which is duplicated by a more appressed series; apical posteroventral bristle strong, equal in size to basal bristle of hind metatarsus. Fifth tarsal segment of all tibiae slightly flattened dorsoventrally. Fore claws pubescent; fore pulvilli larger than mid and hind pairs. Wings broad, costal thorn stout: veins R_{4+5} and M_{1+2} slightly divergent at apices; *m-cu* cross vein sinuate.

Female similar to that of *latipennis* Zett., lighter in color than male; thorax with two brownish streaks along the line of dorsocentral bristles, and with lateral infuscations. Abdomen densely yellowish gray pollinose with dark reflections and a dark indefinite dorsocentral vitta. Wings yellowish, more intensively basad;

calyptrae tinged; halteres pale yellow. Scutellum not setulose on disc. Fore tibia with 1 median anterodorsal and 1 or 2 posteroventral bristles: mid femur with anteroventral surface bare, with 2 or 3 bristles on proximal third of posteroventral surface; mid tibia with 1 anterodorsal, 2 posterodorsal, and 2 or 3 posteroventral bristles: hind femur with 5 to 7 anteroventral bristles, and 4 or 5 posteroventral bristles on proximal half; hind tibia with 3 or 4 anteroventral, 5 anterodorsal, 3 or 4 posterodorsal bristles, apical posteroventral bristle as strong as that of anteroventral surface. Apical segment of all tarsi slightly broadened. Length, 6.5 mm.

Records:—1 ♂ Nordegg, Alta., June 16, 1921 (J. McDunnough); 1 ♀ Waterton, Alta., Aug. 13, 1922 (H. L. Seamans); 1 ♀ Fort Simpson, McKenzie River, June 22, 1922 (C. H. Crickmay); 1 ♀ Keremeos, B. C., June 26, 1923 (C. B. Garrett).

Type, allotype and *paratype*, No. 2922 in Canadian National Collection.

The species superficially resembles *latipennis* Zett., but may be differentiated in both sexes by the presence of strong apical bristle on posteroventral surface of hind tibia, and a series of posteroventral bristles on hind femur: in the female, further, by the size of fifth tarsal segment of fore tibia which is not much larger than that of mid and hind tibiae.

Hylemyia lobata sp. nov.

Male blackish: head with frontal vitta opaque black; parafacials and cheeks velvety pruinescent with black reflections; antennae and palpi black: thorax with light brownish gray pollen, subshining, with dark reflections, when viewed from above and behind with three faint vittae; abdomen more highly shining than thorax, with a broad black glossy dorsal band on segments 1 plus 2, 3 and 4, laterad of which there are faint indications of brownish gray pollen; tergum 5 and hypopygium entirely glossy black. Legs subshining, black. Wings grayish tinged, blackened basad; calyptrae whitish; halteres yellowish with traces of black.

Head with eyes separated at narrowest by a distance equal to that between posterior ocelli inclusive; parafrontals separated throughout by frontal vitta which becomes considerably broadened cephalad, with 6 or 7 pairs of frontal bristles, in profile slightly elevated above margin of eye; parafacials at base of antennae prominent, wider than breadth of third antennal segment, narrowed ventrad; cheeks at narrowest not as wide as breadth of third antennal segment, the latter about 1.25 times as long as broad; arista slightly swollen basad, microscopically pubescent; ventral margin of cheeks with a dense series of robust bristles; proboscis short. Thorax with acrosticals weak and irregularly paired; posthumeral bristle duplicated; prealar bristle longer than posterior notopleural bristle; sternopleural bristles, 2: 3. Abdomen broad, much thickened, hypopygium large and globose, processes of fifth sternum with a dense brushlike series of short stiff black setulae on proximal half of inner surface, the apical third of inner margin with a series of 6 or 7 fine, longer, hairlike setulae which curl inward, inner border bare, outer border with a series of bristles which become longer and stronger apicad; cerci (upper forceps) divided longitudinally into two narrow lobes which are clothed with a shaggy tuft of fine slender bristles.

Fore tibia with a median posteroventral bristle and a pointed apical posteroventral bristle; mid femur with a series of weak anteroventral bristles except

for one or two on median third which are stronger and bristlelike, posteroventral surface with 4 or 5 long slender bristles on proximal half; mid tibia with 1 anterodorsal, 2 posterodorsal and 2 posteroventral bristles; hind femur with an entire series of anteroventral bristles and a series of finer bristles on part of the posteroventral surface; hind tibia with 3 or 4 anteroventral, 4 or 5 anterodorsal, and 3 or 4 posterodorsal bristles, posteroventral surface with a partial series of setulae. Wings comparatively short and wide, with veins R_{4+5} and M_{1+2} subparallel; costal thorn moderately stout; *r-m* cross vein oblique, *m-cu* cross vein nearly erect.

Female similar to male, abdomen entirely glossy, with no trace of dorsal marking; eyes separated by a distance greater than length of antenna; cruciate bristles present; ovipositor compressed laterally; fore tibia with a median anterodorsal, and with or without 1 or 2 posteroventral bristles; mid femur with a series of weak anterodorsal bristles except for two bristles on median third which are stout and long, with 3 posteroventral bristles on proximal half; mid tibia with 1 anteroventral, 1 anterodorsal, 2 posterodorsal, and 2 or 3 posteroventral bristles; hind femur with 5 to 7 anteroventral bristles, and a proximal series of 3 or 4 unequal posteroventral bristles; hind tibia with 2 or 3 anteroventral, 4 or 5 anterodorsal, and 4 posterodorsal bristles. Wings with costal thorn strong, costal setulae semierect; *m-cu* and *r-m* cross veins erect; veins R_{4+5} and M_{1+2} subparallel. Length, 5.5 mm.

Records:—1 ♂ Banff, Alta., May 25, 1922; 3 ♂ May 26, 1922; 1 ♀ May 27, 1922; (C. B. D. Garrett); 8 ♂ 3 ♀ Ft. St. John, B. C., June 15, 1927 (P. N. Vroom).

Type, allotype and *paratypes,* No. 2923 in Canadian National Collection.

This species undoubtedly belongs to the same group as *sepia* Zett., *penicillaris* Stein, and *sinuata* Mall. It differs most noticeably from these forms in the structure of the genitalia, otherwise there is a very close similarity between the species. The male has no anteroventral bristle on mid tibia, such as is present in *sinuata, penicillaris,* and *sepia.*

Hylemyia aquitima sp. nov.

Male blackish; head black with silvery pruinescence; frontal vitta, antennae and palpi black; thorax subshining, with grayish pollen, viewed from behind the scutellum has a brownish patch on disc, the mesonotum with a brownish median vitta, the sublaterals obscure; abdomen more highly shining than thorax and with lighter grayish pollen; dorsocentral vitta black, becoming faintly tan colored at caudal margin of each tergum, and merging cephalad into the narrow tergal incisures. Legs blackish, pulvilli faintly tinged. Wings tinged, densely infuscated basad; veins chocolate brown; calyptrae whitish; halteres yellow.

Head with eyes separated at narrowest by a distance not greater than that between posterior ocelli; frontal vitta narrowly separating the parafrontals cephalad of ocellus, gradually broadening toward base of antennae; ocellar bristles weak, scarcely longer than ocellar setulae, cruciate setae present: parafrontals with 7 to 8 pairs of bristles; parafacials at base of antennae wider than breadth of third antennal segment, slightly narrowed ventrad; cheeks with buccal area broad, considerably constricted caudad by the invasion of setulae; marginal bristles numerous and robust, in an irregular series, many upturned on buccal area; antennae

with third segment nearly twice the length of second; arista microscopically pubescent, not noticeably thickened at base; palpi slender, filiform. Thorax with numerous scattered accessory setulae; acrosticals paired, each series closely approximating one another, with four presutural pairs of unequal development; posthumeral bristles duplicated; prealar bristles shorter than posterior notopleural bristle; sternopleural bristles, 2:3. Abdomen elongate, slightly tapering caudad, distal half moderately thickened in profile; inner margin of processes of fifth sternum with a few fine hairs and an apical series of four stout, black, blunt setae, outer border with numerous bristles.

Fore tibia with a median posteroventral bristle and a blunt tipped apical posteroventral bristle; mid femur with a series of short bristles on proximal half of anteroventral surface, and a series of 7 to 9 strong posteroventral bristles on proximal two-thirds of posteroventral surface; mid tibia with 1 anterodorsal, 1 posterodorsal, and 3 posteroventral bristles; hind femur with a series of 14 short anteroventral bristles which become much smaller proximad, all except the two apical bristles shorter than breadth of femur where situated, posteroventral surface with a complete series of fine short bristles; hind tibia with a series of 10 short anteroventral bristles, which become stouter and more widely spaced on distal half, 7 anterodorsal, and 3 to 5 posterodorsal bristles, and a series of 14 posteroventral setulae, which is duplicated for about three-quarters of its length by a more appressed series of setulae. Mid tarsus slightly shorter than mid tibia, mid metatarsus with a distinct fringe of longish dorsal setulae, mid tarsal apical thorns of normal appearance. Tarsal claws equal in length to their respective pulvilli. Fore pulvilli larger than mid and hind pairs. Wings with costal thorn short; veins R_{4+5} and M_{1+2} convergent toward apices; *m-cu* cross vein slightly sinuate. Length, 6 mm.

Records:—1 ♂ Waterton, Alta., June 21, 1923; 1 ♂ July 1, 1924 (H. L. Seamans).

Type, No. 2924 in Canadian National Collection.

This species very closely resembles *cilifera* Mall., the type of which has been kindly loaned me for study by Dr. T. H. Frison. The male of *cilifera* differs from that of *aquitima* in the following respects only; the pruinosity of the thorax and abdomen is yellowish gray, not whitish; the mid and hind tibiae are decidedly reddish infuscated, lighter in color than femora, not blackish and concolorous with femora; the veins of the wings are yellowish brown, not dark chocolate brown; the parafacials are uniformly broad throughout, not narrowed ventrad; most of the bristles on the proximal half of antero- and posteroventral surfaces of hind femur are nearly equal in length to width of femur,, and not much shorter than width where situated; processes of fifth sternum have no sparse series of hairs on inner margin; the cerci (upper forceps) are narrow, elongate, not heartshaped. In the description of *cilifera* Malloch states that the processes of fifth sternum are bare on inner margin. There are however a series of 4 stout blunt setae at apex of inner margin as in *aquitima*.

Hylemyia brunetta sp. nov.

Male blackish; head with velvety pruinescence, tinged with cinerous gray; frontal vitta opaque black, with cinerous pruinescence when viewed from below; face grayish black; antennae and palpi black; thorax with mesonotum subshining,

blackish infuscated, when viewed at an angle from in front with traces of three narrow vittae, scutellum blackish; abdomen lightly brownish gray pollinose, viewed from behind with a distinct though not intensively marked dorsocentral vitta, the latter merges caudad and cephalad with the narrow incisures on each tergum, when viewed from above and in front these markings disappear in dark reflections; hypopygium blackish, shining, the ultimate (prebasal) segment lightly pollinose dorsad, ventral border glossy and highly polished; processes of fifth sternum with inner border and apical region glossy and polished, outer border and basal region lightly pollinose. Legs black, pulvilli tinged. Wings and calyptrae tinged, the former more intensively infuscated basad, the latter with brownish margins; veins chocolate brown; halteres yellowish, tinged with brown.

Eyes separated at narrowest by a distance equal to that between posterior ocelli; parafrontals separated by frontal vitta for its entire length, the latter gradually broadened cephalad, with seven pairs of weak frontal bristles; cruciate setulae present; parafrontals in profile distinctly elevated above margin of eye; parafacials, at base of antennae, and cheeks broader than width of third antennal segment, the former slightly narrowed ventrad, the latter considerably constricted caudad by the encroachment of marginal setulae; marginal bristles in an irregular series; vibrissal area with 8 or 9 relatively strong bristles; third antennal segment nearly 1.5 times as long as wide; arista almost bare, swollen at base; palpi narrowly clavate; proboscis polished. Thorax with acrosticals paired, with three bristlelike presutural pairs: posthumeral bristles duplicated: prealar bristle longer than posterior notopleural bristle, the latter stoutly developed and about equal to two-thirds length of anterior notopleural bristle; sternopleural bristles, 1 or 2:3; scutellum with basal pair of bristles well developed. Abdomen short, conical, slightly thickened caudad; processes of fifth sternum knifeshaped, viewed in profile appear as two thin parallel plates rounded at apex, the ventral (inner) margin with a fringe of fine hairs, the ventral border and apical region bare and glossy, the dorsal (outer) border and basal region with a few short setae.

Four femur with bristles on posterior surface rather fine and shaggy: fore tibia with 1 median posteroventral and a sharp pointed apical posteroventral bristle: mid femur with a posteroventral series of 6 or 7 bristles on proximal two-thirds, the apical third with series of setulae: mid tibia with 1 short median posterior bristle; hind femur with 7 or 8 anteroventral bristles, and 5 bristles on proximal half of posteroventral surface; hind tibia with 2 anteroventral, 2 anterodorsal, and 3 posterodorsal bristles. Fore tarsi with pulvilli large, those of hind legs slightly smaller than those of fore and mid legs. Wings pointed, costal thorn small: veins R_{4+5} and M_{1+2} slightly divergent toward wing margin: *m-cu* cross vein slightly sinuate.

Female similar to male, lighter in color, frontal vitta with an orange red patch at base of antennae, blackened caudad: parafacials at base of antennae, and cheeks ventrad of eye margin without a fuscous pruinescent spot; antennae black, palpi fuscous; thoracic and abdominal markings indefinite; wings with veins brownish; calyptrae whitish, halteres yellow.

Head with cruciate bristles present: arista microscopically pubescent: palpi with long fine bristles. Mesonotum with numerous accessory setulae, with four series of fine setulose acrosticals: posthumeral bristle not duplicated, prealar

bristle longer than posterior notopleural bristle; sternopleural bristles, 1:2: scutellum setulose. Fore tibia with 1 median dorsal and posteroventral bristle; mid femur with 2 stout anteroventral bristles on median third, and 2 or 3 posteroventral bristles on proximal half: mid tibia with 1 anteroventral, 1 anterodorsal, 2 posterdorsal, and 1 or 2 posteroventral bristles; hind femur with 5 or 6 anteroventral, and 3 or 4 proximal posteroventral bristles: hind tibia with 2 to 4 anteroventral, 4 or 5 anterodorsal, and 3 or 4 posterodorsal bristles. Wings with veins R_{4+5} and M_{1+2} subparallel. Length, 5.75 mm.

Records:—1 ♂ Seton Lake, Lillooet, B. C., June 4, 1926 (J. McDunnough); 1 ♀ Banff, Alta., July 12, 1922 (C. B. D. Garrett).

Type and *allotype*, No. 2925 in Canadian National Collection.

The peculiar form of the processes of fifth sternum of male serves to readily distinguish this species from its closest relatives. In this respect it may be comparable to *brevitarsis* Mall. and *bicruciata* Mall. The female is characterised by the possession of a dense series of setulose acrosticals, two stout bristles on median third of anteroventral surface of mid femur, and a median anteroventral bristle on mid tibia.

Hylemyia pilicauda sp. nov.

Male blackish; head with frontal vitta blackish tinged with reddish at base of antennae; parafrontals with blackish reflections; parafacials and cheeks silvery pruinescent with reddish to blackish reflections; antennae and palpi blackish. Thorax largely greased, apparently grayish pollinose, viewed from behind with three vittae and infuscated areas caudad of humeral callosities. Abdomen grayish pollinose, with dark reflections: dorsocentral vitta, viewed laterad, fuscous, merging into the dark reflections along the cephalic and caudal margins of terga; hypopygium lightly pollinose, subshining, processes of fifth sternum blackish, subshining. Legs blackish, pulvilli tinged. Wings tinged throughout, veins brownish, calyptrae whitish, halteres yellow.

Head with eyes separated at narrowest by a distance equal to that between posterior ocelli inclusive; frontal vitta ribandlike, gradually expanding cephalad, with two pairs of cruciate setulae; parafacials at base of antennae wider than breadth of third antennal segment, narrowed ventrad: cheeks about equal to breadth of third antennal segment; parafrontals with four or five pairs of bristles, and a minute pair of setulae cephalad of anterior ocellus; arista minutely pubescent, longest hairs not longer than basal diameter of arista; marginal bristles of cheeks in an irregular series, vibrissal area with a number of fine setulae; palpi slightly flattened distad.

Thorax with acrosticals irregularly paired, with a few accessory setulae between the bristles; three pairs of presutural acrosticals; posthumeral bristles weakly duplicated; prealar bristle shorter than posterior notopleural bristle; sternopleural bristles, 1:2. Abdomen broad, gradually tapering caudad, truncate, in profile depressed cephalad, thickened caudad: hypopygium prominent, basal sclerite clothed with numerous uniform bristles, prebasal (ultimate) sclerite rounded and clothed with a few short setulae and very weak bristles, the anal membrane very much restricted in area; processes of fifth sternum with a dense series of longish hairs and setulae on inner margin, inner border with a basal series of 5 or 6 weak bristles, outer border with a scattered clothing of fine bristles which become stronger and longer apicad.

Fore tibia with 1 or 2 short median anterodorsal bristles and 1 longish posteroventral bristle, apical posteroventral bristle pointed; mid femur with a series of anteroventral and posteroventral bristles which become weaker and much shorter distad; mid tibia with 2 anterodorsal, 3 posterodorsal and 1 posteroventral bristle: hind femur with an entire series of anteroventral bristles which are strongest and longest at middle of series, with a series of posteroventral bristles which has one or two very strong bristles at middle of series and much weaker, shorter, and closely set bristles on distal third; hind tibia with 2 or 3 anteroventral, 4 anterodorsal, and 3 posterodorsal bristles, and a series of 4 or 5 setulae on proximal half of posteroventral surface, apical posteroventral bristle weakly developed. Fore tarsi longer than fore tibiae, mid and hind tarsi about equal to length of their respective tibiae; claws robust, pulvilli large. Wings with costal thorn short and stout; veins R_{4+5} and M_{1+2} noticeably divergent at wing margin, *m-cu* cross veins oblique and sinuate. Length, 6 mm.

Records:—1 ♂ Oliver, B.C., April 20, 1923 (C. B. D. Garrett).

Type, No. 2926 in Canadian National Collection.

The male may be readily recognized by the peculiar, enlarged, rounded appearance of the prebasal sclerite of hypopygium which is destitute of normal bristles.

Hylemyia egleformis sp. nov.

Male grayish; head with frontal vitta tinged with reddish cephalad; parafrontals, parafacials and cheeks whitish pruinescent with reddish to blackish reflections; antennae and palpi black, proboscis polished. Thorax largely greased, viewed from behind with indications of three narrow vittae. Abdomen lightly grayish pollinose, with dark reflections, viewed from behind, each tergum has a narrow, black, subtriangular dorsocentral mark; hypopygium more lightly pollinose, subshining. Legs black, pulvilli tinged. Wings uniformly light brownish tinged, veins light brown, calyptrae whitish, halteres yellow.

Head with eyes separated by diameter of anterior ocellus at narrowest distance, parafrontals contiguous cephalad of anterior ocellus; frontal vitta narrowly and gradually broadened cephalad; parafrontals with five pairs of bristles, cruciate setulae present: cheeks and parafacials at base of antennae equal to breadth of third antennal segment, parafacials slightly narrowed ventral: buccal area pronounced; ventral margin of cheeks with a single series of weak unevenly developed bristles: oral margin, viewed in profile, produced beneath apex of antennae: antennae conspicuously separated at base by a pronounced facial elevation, third antennal segment fully one and a half times as long as broad; arista short pubescent, the hairs slightly longer than basal diameter of arista, basal swelling small: palpi and proboscis narrow and slender. Thorax with acrosticals irregularly paired, the bristles narrowly separated, with one strongly developed presutural pair, the remainder setulose; posthumeral bristles weakly duplicated; prealar bristle shorter than posterior notopleural bristle, the latter about equal to anterior bristle; sternopleural bristles, 1:2 or 3. Abdomen gradually tapering caudad, depressed on proximal half and slightly thickened on distal half; dorsum of terga sparsely bristled, the ventral (lateral) areas more densely bristled: fourth sternum with a few noticeable bristles; processes of fifth sternum with fine bristles, the inner margin with a few fine hairs and 4 or 5 black blunt apical setae, outer border

with fine scattered bristles, at the apex of which there are two noticeably straight and stronger bristles than remainder.

Legs slender, fore tibia with a median posteroventral bristle and a blunt apical posteroventral bristle; mid femur with a series of weak anteroventral bristles, and 5 bristles on proximal half of posteroventral surface; mid tibia with 1 anterodorsal, 1 posterodorsal, and 2 posteroventral bristles; hind femur with an anteroventral series of bristles which become much weaker and shorter on proximal than on distal half: posteroventral surface bare except for a few apical bristles: hind tibia with 4 or 5 anteroventral, 4 anterodorsal, 3 to 5 posterodorsal bristles, and a partial series of posteroventral setulae. Tarsi slender, laterally compressed: pulvilli large, fore pair longer than mid and hind pairs. Wings with costal thorn small: veins R_{4+5} and M_{1+2} convergent at apices: ultimate section of vein M_{1+2} twice as long as the penultimate section; *m-cu* cross vein erect, slightly sinuate. **Length, 4.75 mm.**

Record:—1 ♂ Low Bush, Lake Abitibi, Ontario, June 20, 1925 (N. K. Bigelow).

Type No. 2927 in Canadian National Collection.

The male of this species runs down to *angustitarsis* Mall. in Malloch's key (3). It differs principally however from the description of this species in having blunt apical setae on the inner margin of processes of fifth sternum.

Hylemyia seamansi sp. nov.

Male grayish with seal-brown markings; head with frontal vitta opaque black; parafacials and cheeks velvety whitish pruinescent with black reflections; antennae and palpi blackish; proboscis shining, lightly pollinose. Thorax drab grayish, pollinose, the mesonotum with three brownish vittae and more or less brownish infuscated; abdomen grayish pollinose with dark reflections, frequently superimposed with sealbrown fuscation which obscures the abdominal vitta, the latter, viewed from behind, composed of broad, indefinite, subtriangular tergal marks. Legs blackish; pulvilli tinged. Wings tinged, more densely so basad; veins chocolate brown. Calyptrae whitish; halteres yellow.

Head with eyes separated by a distance not greater than that between posterior ocelli inclusive; parafrontals narrowly separated by the frontal vitta cephalad of anterior ocellus, with five or six pairs of frontal bristles; cruciate setulae present; parafacials at base of antennae slightly wider than breadth of third antennal segment, narrowed ventrad; cheeks as wide as breadth of third antennal segment, with an irregular series of ventral bristles along margin, those on buccal area upturned; oral margin produced cephalad beneath the apices of antennae; arista minutely pubescent, swollen at base. Palpi moderately short, not as long as arista, slightly flattened distad. Proboscis narrow.

Thorax with acrosticals setulose, in an irregular single series; prealar bristle absent; sternopleural bristles, 1:3. Abdomen depresesd, margins subparallel, gradually tapering caudad; processes of fifth sternum short and stout, inner margin convex in outline, approximating at middle, with a few fine hairs on proximal half and two strong, pointed, black setae at middle, outer border with a dense irregular series of bristles which become much longer and stronger apicad, cerci with a dense preapical tuft of long, black, lashlike bristles which extend cephalad to base of abdomen, each bristle becomes fine and curly distad.

Fore tibia with a median posteroventral bristle and a small blunt apical posteroventral bristle; mid femur with a series of weak anteroventral bristles and a series of 7 or 8 short bristles on proximal two-thirds of posteroventral surface; mid tibia with 1 or 2 anteroventral bristles, one of which is situated on distal third of tibia, with or without an anterodorsal bristle, with 1 posterodorsal, and 2 posterior bristles; hind femur with an anteroventral series of bristles which become much weaker proximad, posteroventral surface bare except for apical bristles: hind tibia with 4 or 5 anteroventral, 2 or 3 anterodorsal, 3 posterodorsal bristles, and a median series of posteroventral setulae. Pulvilli and claws small. Wings with costal thorn small; veins R_{4+5} and M_{1+2} subparallel; *m-cu* cross veins erect.

Female similar in colour to male, frontal vitta with a reddish black tinge cephalad; abdomen with no dorsocentral vitta. Head with cruciate bristles present; third antennal segment slightly tapered apicad; cheeks with marginal bristles very weak; proboscis polished. Thorax with sternopleural bristles, 1:2, the ventral bristle of caudal pair very weak. Fore tibia with no median anterodorsal bristle, and 1 median posteroventral bristle; mid femur with or without a short weak bristle on basal third of posteroventral surface, basal bristle on ventral surface well developed; mid tibia with 3 anteroventral, 1 anterodorsal, 1 posterodorsal, 2 posterior, and 1 posteroventral bristle; hind femur with 5 or 6 bristles on distal two-thirds of anteroventral surface, posteroventral surface bare: hind tibia with 3 anteroventral, 2 or 3 anterodorsal, and 3 posterodorsal bristles. Wings with costal thorn small. Length, 4.75-5 mm.

Records:—1 ♂ Waterton, Alta., June 10, 1923; 2 ♂ 1 ♀ June 20, 1923; 1 ♂ June 24, 1923 (H. L. Seamans); 1 ♂ Ft. St. John, B.C., June 15, 1927 (P. N. Vroom); 1 ♂ Low Bush, Lake Abitibi, Ont., June 10, 1925; 1 ♂ July 17, 1925 (N. K. Bigelow).

Type, allotype and *paratypes*, No. 2928 in Canadian National Collection.

Named in honour of Mr. H. L. Seamans in appreciation of his extensive collecting activities in this group of flies.

The male of this species together with the four following have in common striking tufts of long bristles arising from the cerci. In *seamansi* such bristles extend to nearly the length of abdomen. The male may be further recognized by the absence of the prealar bristle, the single series of acrostical bristles, the presence of anteroventral bristles on mid tibia, and the absence of bristles on posteroventral surface of hind femur.

(To be continued)

Mailed Saturday, July 6, 1929.